UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/718,837	11/21/2003	Balaji Raghothaman	873.0134.U1(US)	1329

29683   7590   03/12/2008
HARRINGTON & SMITH, PC
4 RESEARCH DRIVE
SHELTON, CT 06484-6212

EXAMINER
PASIA, REDENTOR M

ART UNIT	PAPER NUMBER
2616	

MAIL DATE	DELIVERY MODE
03/12/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| **Office Action Summary** | Examiner | Art Unit | |
| | REDENTOR M. PASIA | 2616 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/10/2007*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-11 and 14-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-11 and 14-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All   b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

1.   Applicant's amendment filed on December 10, 2007 has been entered. Claims

1, 6, 11, 14-23 have been amended. Claims 5, 12-13 have been canceled. Claims 24-

26 have been added. Claims 1-4, 6-11 and 14-26 are still pending in this application,

with claims 1, 11, 21, and 22 being independent.

Claim Rejections - 35 USC § 102

2.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by
> another filed in the United States before the invention by the applicant for patent or (2) a patent
> granted on an application for patent by another filed in the United States before the invention by the
> applicant for patent, except that an international application filed under the treaty defined in section
> 351(a) shall have the effects for purposes of this subsection of an application filed in the United States
> only if the international application designated the United States and was published under Article 21(2)
> of such treaty in the English language.

3.   Claims 1-4, 6-7, 9-11, 14-16, 18-23, 25-26 are rejected under 35 U.S.C. 102(e)

as being anticipated by Ketchum et al. (US 2003/0048856 A1; hereinafter Ketchum).

As to claim 1, Ketchum shows a method (abstract) comprising: encoding (Figure

4a, 4b, encoder 412) a plurality of N systematic bit (Figure 4a, 4b, information bits)

across time (Par. 0099, the base code maybe a turbo code, convolutional code) into an

encoded packet of size M bits (Figure 4a, 4b, modulation symbols); determining a

quality of at least a first channel from a feedback circuit (Figure 3,4b, ful/partial channel

state information CSI); dividing (Figure 4a, 4b, demux 424; page 9, equation 27) the

encoded packet into a first transmission packet defining a first size M1 bits that includes

N1 of the N systematic bits and a second transmission packet defining a second size

M2 bits that includes N2 of the N systematic bits (Table 1, shows the # of Information

bits/symbol (N) with their respective # of coded bits/symbol (modulation symbols).),

wherein at least one of M1 and N1 is based on the determined quality of the first

channel (Figure 3, 4B, shows the CSI link; Table 1, shows a column indicating the

received SNR; Equation 27) and transmitting in parallel (Par. 0124; multiple parallel

transmission channels supported by MIMO) the first transmission packet from a first

antenna (Figure 3, 4a-b, antenna 324a-t) at a first rate at a first power modified by a first

weight value over the first channel and the second transmission packet from a second

antenna (Figure 3, 4a-b, antenna 324a-t) at a second rate at the first power modified by

a second weight value over a second channel (Par. 0107-0111, shows Equation 27 that

shows the weighted modulation symbols with their respective sub-channels), wherein

M, M1, M2, N, N1 and N2 are all non-zero integers (Table 1; M, M1, M2 are the # of

coded bits/symbols (modulation symbols) and N, N1, N2 are the # of information bits

and symbols; Equation 27) except one of N1 and N2 may be zero (The examiner

interprets this claim limitation as having only either N1 or N2 present which suggests

that only one antenna is in use for transmission. In a case, where N1 or N2 is either

zero, it suggests that the demultiplexer only outputs one subpacket (same as the

packet) and the packet is transmitted onto only one of the antennas. Par. 0104, shows

that the demultiplexer demultiplexes the received modulation symbols into a number of

(NT) modulation symbol streams, one stream for each antenna used to transmit the modulation symbols.), M is greater than N (Table 1), M is at least equal to M1+M2, and N is at least equal to N1+N2 (Par. 0104; modulation symbols are "demultiplexed" into modulation symbol streams, one stream for each antenna used; Table 1 shows that the information bits are modulated into coded bits. Hence, coded bits (modulation symbol stream) contain the information bits within.).

As to claim 2, Ketchum shows that the dividing the encoded packet comprises maximizing a number N1 of systematic bits in the first transmission packet (Par. 0106, 0104; Table 1; shows that the demultiplexer demultiplexes the received modulation symbols into a number (N_T) of modulation symbol streams, one stream for each antenna used. In a case, where only one antenna is used, the modulation symbol stream contains all of the initial information bits where it is maximized into one stream.).

As to claim 3, Ketchum shows that N=N1 and N2=0 (Par. 0106, 0104; Table 1; shows that the demultiplexer demultiplexes the received modulation symbols into a number (N_T) of modulation symbol streams, one stream for each antenna used. In a case, where only one antenna is used, the modulation symbol stream contains all of the initial information bits where it is maximized into one stream.).

As to claim 4, Ketchum shows that M1=M2 and N1≠N2 (Par. 0103-0104, Table 1; shows the relationship between information bits and coded bits (modulation symbol stream). In a case where SNR range > 17.35, the information bits (N) per symbol is 5 and # of coded bits (M) per symbol is 6, once the modulation symbols are demultiplexed into a number of (N_T) modulation symbol streams, one stream for each for each antenna

(i.e. 2 antennas) used, M and N (N is encoded in M as discussed above) are divided into two streams. $M_1 = M_2 = 6/2$, and $N_1 = 3$, $N_2 = 2$ (thus, $N_1 \neq N_2$) or the other way around.).

As to claim 6, Ketchum shows the step of transmitting the second transmission packet from the second antenna over the second channel at a second power modified by a third weight value, and from the first antenna over the first channel at the second power modified by a fourth weight value (Par. 0106-0113, shows equation 27, that comprises of 3 matrices, one matrix shows $b1...b_{NC}$ which are the weighted modulation symbols for spatial subchannels $1,2,...N_{NC}$, second matrix shows e_{ij} which are the elements of eigenvector matrix E related to the transmission characteristics and are also take into account in determining effective channel gains $H(j,k)$ and third matrix, $x1...x_{NT}$ which shows the precondition modulation symbols; Par. 0111, shows the multiple preconditioned modulation symbols, transmitted on the channels available and modified by the eigenvector elements).

As to claim 7, Ketchum shows the step of interleaving over the M bits (Figure 4a-b, channel interleaver 414).

As to claim 9, Ketchum shows that the determining a quality of at least a first channel comprises determining a capacity of said first channel (Figure 3, 4b, CSI; Par. 0026; to more fully utilize the capacity of the transmission channels, channel state information (CSI) descriptive of the link conditions may be determined (typically at the receiver system) and provided to the transmitter system.).

As toclaim 10, Ketchum shows that the step of determining a quality of at least a

first channel comprises determining a quality of a second channel (Par. 0026, patial

CSI, may include the SNRs of the transmission channels), and the values of M1 and M2

are determined from the quality of the first and second channels (Table 1, shows the

relationship between SNRs and modulated symbols).

As to claim 11, Ketchum shows a device (figures 3, 4a-b, transmitter 310)

comprising: an encoder (Figures 4a-b, encoder 412) having an input for receiving a

plurality of N systematic bits (Figure 4a-b, information bits) and an output for outputting

a plurality of M bits (Figure 4a-b, modulation symbols), wherein M is greater than N

(Table 1); a channel feedback circuit for determining a channel characteristic of a first

communication channel (Figures 3, 4b, channel state information (CSI) feedback);

a demultiplexer (Figure 4a-b, demux 424, Par. 0104; a demultiplexer 424 receives and

demultiplexes the weighted modulation symbol into a number of modulation symbol

streams, one stream for each transmission channel selected to transmit the modulation

symbols.) having an input coupled to an output of the encoder and an input coupled to

an output of the channel feedback circuit (Figure 4b), said demultiplexer for outputting in

parallel a first portion M1 of the M bits at a first output and a second portion M2 of the M

bits at a second output (Figure 4a-b; Par. 0104; Equation 27); a first amplifier (Figure

4a-b, modulator 322a-t) coupled to said first output for increasing a power of said first

portion M1 of the M bits (Par. 0104; each modulator further amplifies a modulation

symbol); a first antenna (Figure 4a-b, 324a-t) coupled to the first output for transmitting

said first portion M1 of the M bits (Par. 0092, transmitted via respective antenna 324);

and a second amplifier (Figure 4a-b, modulator 322a-t) coupled to said second output

for increasing a power of said second portion M2 of the M bits (Par. 0104; each

modulator further amplifies a modulation symbol); a second antenna (Figure 4a-b, 324a-

t) coupled to the second output for transmitting said second portion M2 of the M bits

(Par. 0092, transmitted via respective antenna 324); and a first eigenvector block in

series with the first output, said first eigenvector block coupled to said first and said

second antenna for applying a first power weight factor (Par. 0110, e_{ij} are elements of

eigenvector matrix E) to said first portion M1 of the M bits prior to transmission from said

first antenna and for applying a second power weight factor to said first portion M1 of

the M bits prior to transmission from said second antenna (Par. 0106-0113, shows

equation 27, that comprises of 3 matrices, one matrix shows $b_1...b_{NC}$ which are the

weighted modulation symbols for spatial subchannels $1,2,...N_{NC}$, second matrix shows

e_{ij} which are the elements of eigenvector matrix E related to the transmission

characteristics and are also take into account in determining effective channel gains

$H(j,k)$ and third matrix, $x_1...x_{NT}$ which shows the precondition modulation symbols; Par.

0111, shows the multiple preconditioned modulation symbols, transmitted on the

channels available and modified by the eigenvector elements).

As to claim 14, Ketchum shows that said first and second power weight factor are

based on at least one of a size of said first MI and second M2 portion and a channel

quality of a first and second channel provided by said channel feedback circuit (Par.

0106-0113, shows equation 27; e_{ij} are elements of an eigenvector matrix E related to

the transmission characteristics from the transmit antennas to the receive antennas)

said first antenna transmitting over said first channel and said second antenna

transmitting over said second channel (Figure 3).

As to claim 15, Ketchum shows a second eigenvector block in series with the

second output, said second eigenvector block coupled to said first and said second

antenna for applying a third weight factor to said second portion M2 of the M bits prior to

transmission from said second antenna and for applying a fourth power weight factor to

said second portion M2 of the M bits prior to transmission from said first antenna (Par.

0106-0113, shows equation 27, that comprises of 3 matrices, one matrix shows $b_1...b_{NC}$

which are the weighted modulation symbols for spatial subchannels $1,2,...N_{NC}$, second

matrix shows e_{ij} which are the elements of eigenvector matrix E related to the

transmission characteristics and are also take into account in determining effective

channel gains H(j,k) and third matrix, $x_1...x_{NT}$ which shows the precondition modulation

symbols; Par. 0111, shows the multiple preconditioned modulation symbols, transmitted

on the channels available and modified by the eigenvector elements).

As to claim 16, Ketchum shows that said third and fourth power weight factors

are based on at least one of a size of said first M1 and second M2 portion and a

channel quality of a first and second channel provided by said channel feedback circuit

(Par. 0106-0113, shows equation 27; e_{ij} are elements of an eigenvector matrix E related

to the transmission characteristics from the transmit antennas to the receive antennas),

said first antenna transmitting over said first channel and said second antenna

transmitting over said second channel (Figure 3).

As to claim 18, Ketchum shows that the first M1 and second M2 portion are the same size and the systematic bits are not equally distributed among the first Mi and second M2 portion (Par. 0103-0104, Table 1; shows the relationship between information bits and coded bits (modulation symbol stream). In a case where SNR range > 17.35, the information bits (N) per symbol is 5 and # of coded bits (M) per symbol is 6, once the modulation symbols are demultiplexed into a number of (N_T) modulation symbol streams, one stream for each for each antenna (i.e. 2 antennas) used, M and N (N is encoded in M as discussed above) are divided into two streams. M_1 = M_2 = 6/2, and N_1= 3, N_2 = 2 (thus, $N_1{\neq}N_2$) or the other way around.).

As to claim 19, this claim is rejected using the same reasoning set forth in the rejection of claim 2.

As to claim 20, Ketchum shows a first subpacket selector (Figure 3, controller 334) having an input coupled to the first output of the demultiplexer, an input coupled to an output of the feedback circuit, and an output coupled to the first antenna (Figure 4a-b in relation to Figure 3), said first subpacket selector for selecting and combining, into a first transmission packet that is transmitted over the first channel, the first portion M1 and at least one additional subpacket from the first output of the demultiplexer, wherein a size of said first transmission packet is determined at least in part based on the output of channel feedback circuit 21 (Figure 3, 4a-b; Par. 0171-0173; recovers the reported CSI, which is then provided to controller 334; Controller 334 uses the reported CSI to perform a number of functions including (1) selecting the set of N.sub.S best available transmission channels for data transmission, (2) determining the coding and modulation

scheme to be used for data transmission on the selected transmission channels, and (3)

determining the weights to be used for the selected transmission channels. Controller

334 may select the transmission channels to achieve high throughput or based on some

other performance criteria or metrics, and may further determine the threshold used to

select the transmission channels).

As to claim 21, Ketchum shows a method (abstract) comprising: encoding

(Figure 4a, 4b, encoder 412) a plurality of input bits (Figure 4a, 4b, information bits);

based on a determined characteristic of at least a first channel (Figure 3,4b, ful/partial

channel state information CSI), adaptively splitting the encoded input bits into a first

subpacket defining a first subpacket size and a second subpacket defining a second

subpacket size (Figure 4a, 4b, demux 424; page 9, equation 27; Par. 0104, 0106-0113);

and transmitting the first subpacket at a first rate and at a first power modified by a first

weight value over the first channel and the second subpacket at a second rate and at

the first power modified by a second weight value over a second channel (Par. 0106-

0113; shows the multiple preconditioned modulation symbols, transmitted on the

channels available and modified by the eigenvector elements.).

As to claim 22, Ketchum shows an apparatus (Figure 3, 4a-b, transmitter 310)

comprising: an encoder (Figures 4a-b, encoder 412) to encode a plurality of input bits

(figure 4a-b, information bits); a demultiplexer (Figure 4a-b, demux 424), having an

input coupled to an output of the encoder, to adaptively split the encoded plurality of bits

into a first subpacket defining a first subpacket size and a second subpacket defining a

second subpacket size , Par. 0104; a demultiplexer 424 receives and demultiplexes the

weighted modulation symbol into a number of modulation symbol streams, one stream

for each transmission channel selected to transmit the modulation symbols.); a first

antenna (Figure 4a-b, 324a-t) coupled to an output of the demultiplexer, to transmit the

first subpacket (Par. 0092, transmitted via respective antenna 324) at a first rate and at

a first power modified by a first weight value over a first channel (Par. 0106-0113;

Equation 27 27 and corresponding elements); and a second antenna (Figure 4a-b,

324a-t) coupled to an output of the demultiplexer, to transmit the second subpacket

(Par. 0092, transmitted via respective antenna 324) at a second rate and at the first

power modified by a second weight value over a second channel (Par. 0106-0113;

Equation 27 and corresponding elements).

As to claim 23, Ketchum shows a channel feedback circuit, having an output

coupled to an input of the demultiplexer (Figure 3, 4a-b, CSI feedback), to provide a

channel characteristic of at least the first channel by which the demultiplexer adaptively

splits the encoded plurality of bits (Par. 0026; to more fully utilize the capacity of the

transmission channels, channel state information (CSI) descriptive of the link conditions

may be determined (typically at the receiver system) and provided to the transmitter

system.).

As to claim 25, Ketchum shows the step of channel interleaving the encoded

packet of size M bits with other encoded packets (Figure 4a-b; channel interleaver 414);

and wherein dividing the encoded packet is after the channel interleaving (Figure 4a-b,

demux 424 is after channel interleaver 414).

As to claim 26, Ketchum shows a channel interleaver disposed

between the encoder and the demultiplexer and adapted to channel interleave the

encoded packet of size M bits with other encoded packets (Figure 4a-b).

As to claim 27 and 28, these claims are rejected using the same reasoning set

forth in the rejection of claims 25 and 26, respectively.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth
> in section 102 of this title, if the differences between the subject matter sought to be patented and the
> prior art are such that the subject matter as a whole would have been obvious at the time the invention
> was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

5.   Claims 8 and 17 rejected under 35 U.S.C. 103(a) as being unpatentable over

Ketchum et al. (US 2003/0048856 A1; hereinafter Ketchum) in view of Salvi et al. (US

2004/0139383 A1; hereinafter Salvi).

As to claim 8, Ketchum shows the step of interleaving over the M bits (Figure 4a-

b). However, Ketchum does not show that the encoding further comprises turbo

encoding using a single turbo interleaver of size N.

Salvi shows turbo encoding using a single turbo interleaver (Figure 2) of size N

(Table 1, Par. 0048; Par. 0040-0043). It would have been obvious to one of ordinary

skill in the art at the time of the invention to modify the method of Ketchum to include

the features of Salvi in order to shorten delays in coding data (Par. 0010).

As to claim 17, Ketchum shows the transmitter further comprising a channel interleaver of length M having an input coupled to the output of the encoder (Figure 4a-b). However, Ketchum does not show said encoder comprises an interleaver of length N.

Salvi shows said encoder comprises an interleaver of length N (Figure 2; Table 1, Par. 0048; Par. 0040-0043). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Ketchum to include the features of Salvi in order to shorten delays in coding data (Par. 0010).

6.   Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum et al. (US 2003/0048856 A1; hereinafter Ketchum) in view of Kim et al. (US 2003/0128769 A1; hereinafter Kim).

As to claim 24, Ketchum shows all of the elements except wherein the at least one additional subpacket comprises only parity bits.

Kim shows that the at least one additional subpacket comprises only parity bits (Par. 0076; the distribution block 66 distributes only the interleaved parity bits to a transmission antenna with a poor transmission condition.). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Ketchum to include the features of Kim in order to improve system performance by assigning (or mapping) the systematic bits to the bits corresponding to positions more resistive to an error among the bits constituting a symbol and assigning the parity bits to

the bits corresponding to positions relatively susceptible to an error, during modulation (Par. 0017).

Response to Arguments

7.   Applicant's arguments, see page 9-13, filed December 10, 2007, with respect to the rejection(s) of claim(s) 1-4, 7, 9-12 and 20 under under 35 USC 102(e) as anticipated by Walton (US 6785341); claims 5-6 and 13-16 are rejected under 35 USC 103 (a) as obvious over Walton in view of Catreux (US 2005/0053170); claims 8 and 17 are rejected under 35 USC 103(a) as obvious over Walton in view of Salvi (US 2004/139383); claims 18-19 are rejected under 35 USC 103(a) as obvious over Walton; and claims 21-23 are rejected under 35 USC 103(a) as obvious over Walton in view of Ling (US 6961388), have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made as shown in the above rejections.

Conclusion

8.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to REDENTOR M. PASIA whose telephone number is (571)272-9745. The examiner can normally be reached on M-F 7:30am to 4:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Aung Moe can be reached on (571)272-7314. The fax phone number for

the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

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For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

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USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Redentor M Pasia/
Examiner, Art Unit 2616

/Aung S. Moe/

Supervisory Patent Examiner, Art Unit 2616